NANOSTRUCTURED CONVERSION COATINGS ON ALUMINUM ALLOYS FOR ECOLOGIC CATALYSIS

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In many applications alloys of aluminum with silicon are used as the basis for the functional coatings formation [1], in particular catalytic, for combustion chambers of transport engines. However, the processing of silumins is difficult, that is why studying the processes of targeted modification of surface though the formation of nanostructured mixed oxide coatings is an important practical task.

Oxide coatings were formed on rectangular samples of silumins by plasma-electrolytic oxidizing (PEO) in the galvanostatic mode [2]. The chemical composition of the oxide coatings, the surface morphology, topography, corrosion and catalytic properties were studied.

The influence of pyrophosphate cobalt-containing electrolyte composition and operating parameters of PEO on the process of formation of oxide coatings on silumin was studied. It was established that the use of given type solutions contributes the homogenization of surface and creates preconditions for the dopant incorporation to the growing oxide coating. It is advisable to perform formation of PEO-coatings developed globular-mosaic surface, maximum cobalt content, with minimizing impurities in the range of current densities of 3–5 A/dm^2. The regularities of influence of the electrolyte content and parameters of plasma-electrolytic oxidizing of silumin in pyrophosphate cobalt-containing electrolyte were studied. It was established that a change of the working current density and the time of PEO enable us to control the process of cobalt incorporation in matrix of basic metal oxide. It was found that PEO must be performed in the incident power mode. Cobalt incorporation in the surface oxide layers leads to a change in surface morphology and topography. Obtained oxide systems have a high degree of surface development and consist of nanostructured spherical conglomerates. Oxide coatings on silumin incorporated by cobalt possess the increased corrosion resistance and catalytic activity in comparison with pure aluminum oxide. These systems can find application in ecological catalysis.

References

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